NOTE TO SPECIFIERS: Use Conc. 3B in conjunction with Conc. 3 if there will be positive sulfate attack. (See Concrete Manual - table 2.)

b. Cementitious materials options. - Cementitious materials shall be furnished by the Contractor in accordance with one of the following options:

(1) Type II portland cement only.

(2) Type II portland cement plus a class N, F, or C pozzolan.

(3) Type IP(MS) blended hydraulic cement only.

c. Materials. -

(1) Portland cement. - Portland cement shall meet the requirements of ASTM designation: C 150 for type II cement,and shall meet the optional false-set limitation specified therein. Portland cement shall also conform to the low-alkali limitation, unless the Contractor selects aggregates which are not potentially alkali reactive.

(2) Pozzolan. - Pozzolan used under the options specified in subparagraphs b.(2) and (3) above shall meet the requirements of ASTM designation: C 618 for class N, F, or C with the following additional requirements:

(a) The maximum percent of sulfur trioxide shall be 4.0 percent for classes F and C.

(b) The maximum percent loss on ignition shall be 8.0 percent for class N and 2.5 percent for classes F and C.

(c) The pozzolanic activity index with lime shall be determined using 2-inch cubes, and the minimum strength at 7 days shall be 900 pounds per square inch.

(d) Unless the Contractor selects aggregates which are not potentially alkali reactive, pozzolan used under the option specified in subparagraph b.(2) above shall be tested for reduction of mortar expansion at 14 days as specified for class N pozzolan under the optional physical requirements in table 2A of ASTM designation: C 618. However, the cement used in the test shall be low alkali. For the pozzolan to be acceptable, it shall result in an expansion reduction of zero percent or greater when compared to the control test.

Furthermore, pozzolan used under the options specified in subparagraphs b.(2) and (3) above shall not decrease the sulfate resistance of concrete. The following class N pozzolans have been found not to detract from sulfate resistance; therefore, either of them may be used under the options specified in subparagraphs b.(2) and (3) above:

(a) "Lassenite SR" pozzolan, as marketed by Lassenite Industries, Inc., 1475 Terminal Way, Reno NV 89502, from plant located near Herlong, California.

(b) "Sun" pozzolan, as produced by Oregon Portland Cement Co., 111 SE. Madison, Portland OR 97214, from plant located near Lime, Oregon.

Bureau of Reclamation research on class F and C pozzolans has correlated sulfate resistance to a resistance factor, "R." "R" is defined as "(C-5)/F" where "C" is the calcium oxide content of the pozzolan in percent and "F" is the ferric oxide content in percent. The higher the "R" factor, the lower the sulfate resistance expected for concrete containing the pozzolan. When a class F or C pozzolan is used with type II cement or type IP(MS) blended cement, the "R" factor shall be less than 2.5. Calcium and ferric oxide contents shall be determined in accordance with ASTM designation: C 114.

(3) Blended cement. - Blended cement shall meet the requirements of ASTM designation: C 595 for type IP(MS) portland pozzolan cement, and shall meet the following constraints:

(a) The optional false-set limitation specified in ASTM designation: C 150.

(b) The physical requirement of ASTM designation: C 595 for mortar expansion of type P cement at 14 days unless the Contractor selects aggregates which are not potentially alkali reactive.

(c) The pozzolan constituent shall be between 15 and 25 weight percent of the portland pozzolan cement.

(d) The amount of pozzolan in the finished cement shall not vary by more than plus or minus 3 weight percent of the finished cement from that stated by the Contractor in the information submitted to the Contracting Officer as required below.

(e) Pozzolan used in blended cement shall meet the applicable requirements in c.(2) above.

The low-alkali limitation for portland cement and the mortar expansion limit for pozzolan and blended cement may be waived if the Contractor selects concrete aggregate sources which have previously been tested by the Bureau of Reclamation and which, as evidenced by petrographic examination or mortar bar tests, or both, do not contain potentially deleterious amounts of particles which may react with alkalis in cementitious materials. If available, information regarding the potential alkali reactivity of aggregate from a particular source may be obtained from the [1][(Project) Construction Engineer, _____]. If the potential alkali reactivity of an aggregate source is unknown, the low-alkali limitation and mortar expansion limit shall be met.

At least 30 days before first shipment of any cementitious materials, [2](including cementitious materials for use in shotcrete, soil-cement, grout, and precast concrete items such as pipe, beams, and tees,) the Contractor shall inform the Contracting Officer, in writing, of the following:

The names and addresses of cement and pozzolan shipping points
The names and addresses of cement and pozzolan suppliers from which the Contractor will purchase cementitious materials
The names and addresses of contractors to whom cement and pozzolan will be shipped, if other than the prime Contractor
The quantities of cement and pozzolan ordered
Whether cement will be ordered in bulk or in bags
The purchase order number, contract number, or other designation that will identify cement and pozzolan to be used by the Contractor
The source and composition of the constituents in blended cement
The weight percent of the pozzolan constituent in blended cement

The Contractor shall not change the cementitious materials option selected, or sources of cement and pozzolan for providing cementitious materials under the option, without the written approval of the Contracting Officer.

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[1]Revise as required and insert address of field office concerned.
[2]Revise or delete as required.

3-15-85 Revisions: Minor revisions throughout.